

This Page Is Inserted by IFW Operations  
and is not a part of the Official Record

## **BEST AVAILABLE IMAGES**

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

**IMAGES ARE BEST AVAILABLE COPY.**

**As rescanning documents *will not* correct images,  
please do not report the images to the  
Image Problem Mailbox.**

**THIS PAGE BLANK (USPTO)**

# (12) UK Patent Application (19) GB (11) 2 355 092 (13) A

(43) Date of A Publication 11.04.2001

(21) Application No 0015351.0

(22) Date of Filing 22.06.2000

(30) Priority Data

(31) 99023538 (32) 22.06.1999 (33) KR

(71) Applicant(s)

Hyundai Electronics Industries Co., Ltd.  
(Incorporated in the Republic of Korea)  
San 136-1, Ami-ri, Bubal-eub, Ichon-Shi, Kyoungki-do,  
467-860, Republic of Korea

(72) Inventor(s)

Young-Jin Kim

(74) Agent and/or Address for Service

Marks & Clerk  
57-60 Lincoln's Inn Fields, LONDON, WC2A 3LS,  
United Kingdom

(51) INT CL<sup>7</sup>

G06F 11/32

(52) UK CL (Edition S )

G4A AFMD

(56) Documents Cited

GB 2236202 A

EP 0913774 A2

EP 0623878 A2

US 5432715 A

(58) Field of Search

UK CL (Edition S ) G4A AFMA AFMD AFML , H4P  
PEUX

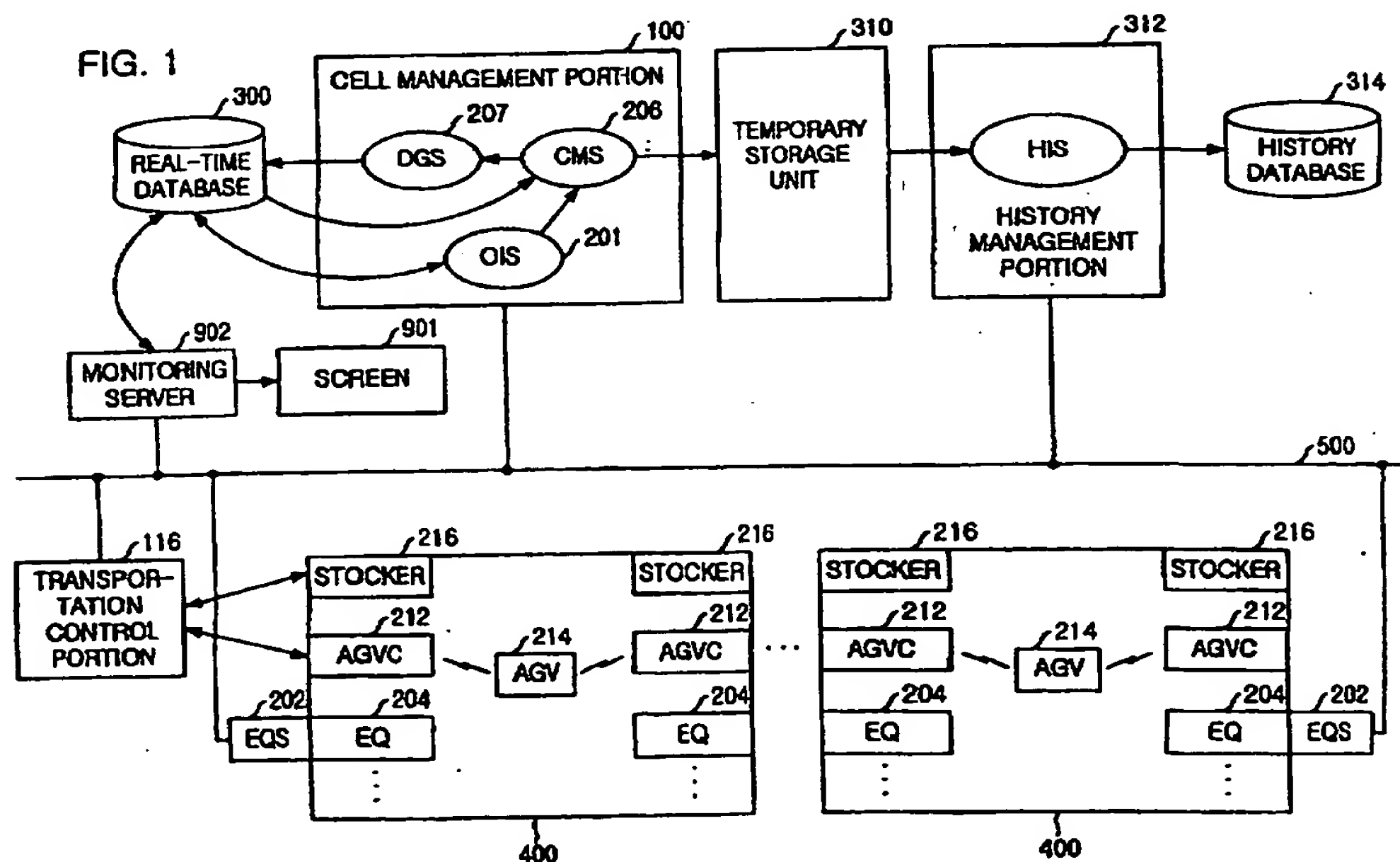
INT CL<sup>7</sup> G06F 11/30 11/32

ONLINE: WPI, EPODOC, JAPIO

(54) Abstract Title

Server monitoring in a semiconductor factory automation system

(57) A method of monitoring servers in a semiconductor factory automation system comprises running a program on a server 202, storing monitoring information in real time 300 and using a monitoring station 902 to retrieve and display the information 901. The information stored includes disk availability, the state of a program and CPU availability. The display means preferably provides a first window to display CPU information and a second window for disk information. Preferably failure information maybe communicated using a number of LED's. A third window may be provided for displaying program information. The processors may be connected by an ethernet network 500. Preferably, the monitored servers govern the semiconductor processing 204 , transportation 212 and wafer stocking 216 means of a semiconductor production facility 400.



GB 2 355 092 A

FIG. 1

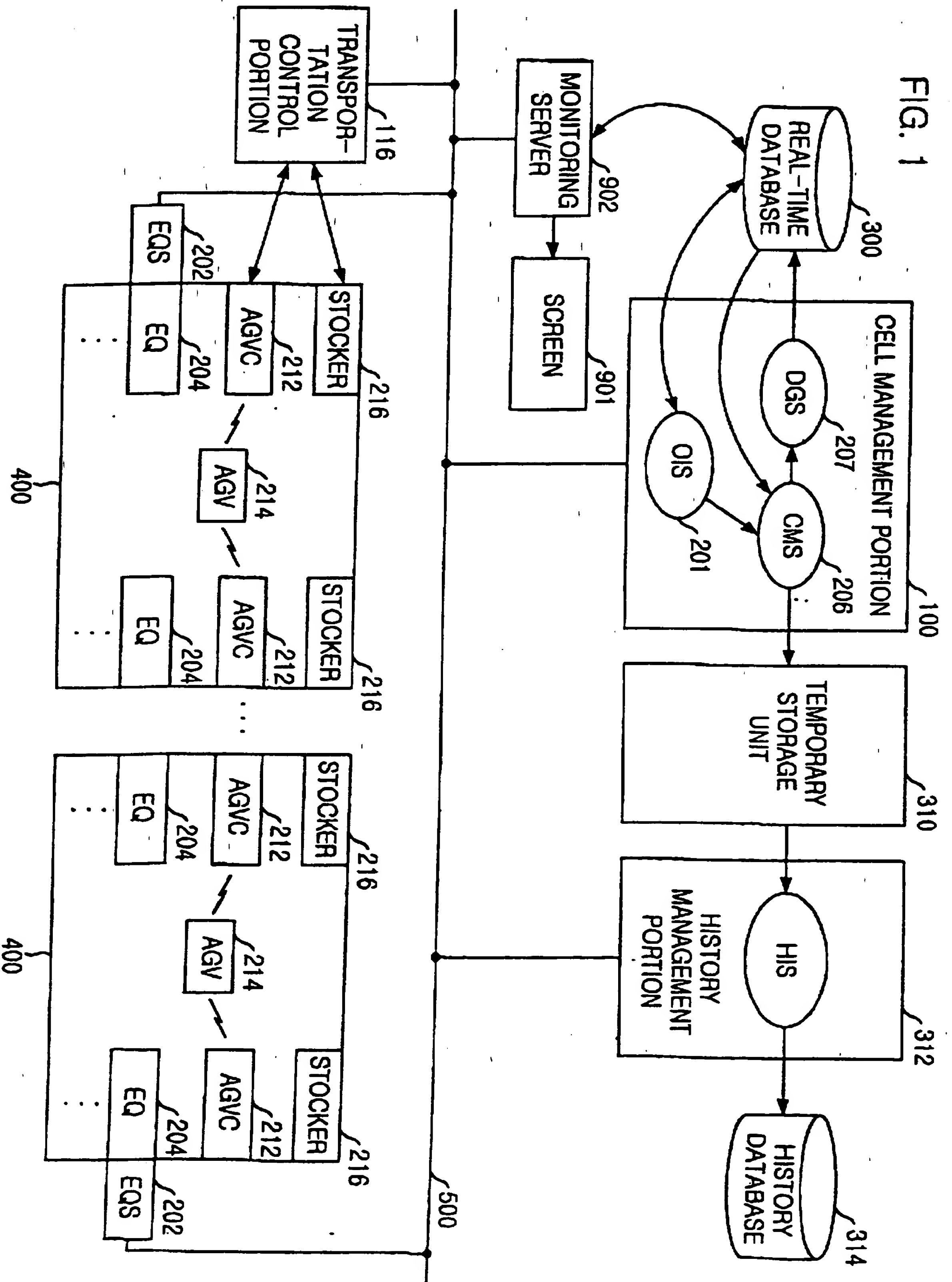


FIG. 2

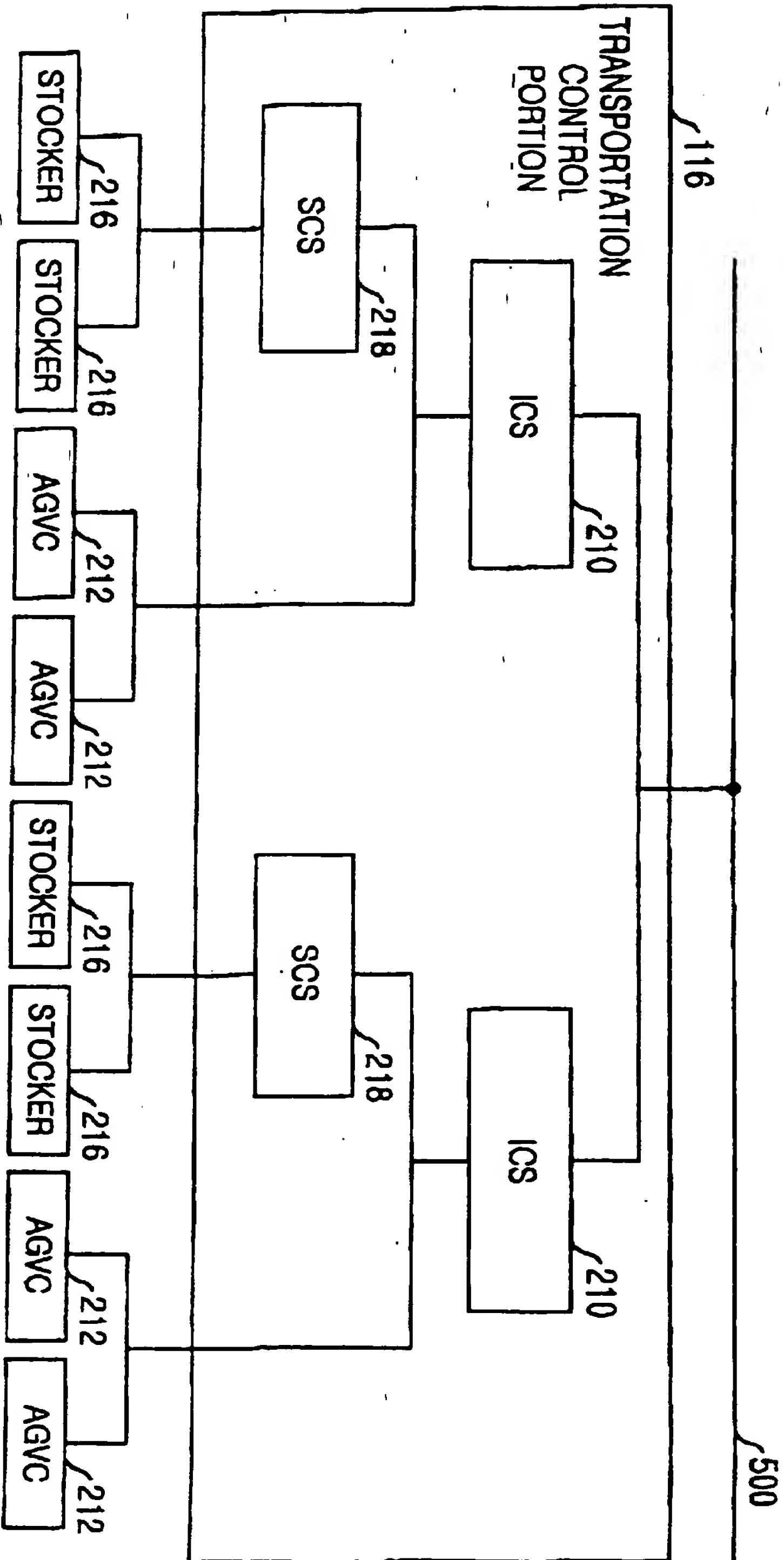


FIG. 3

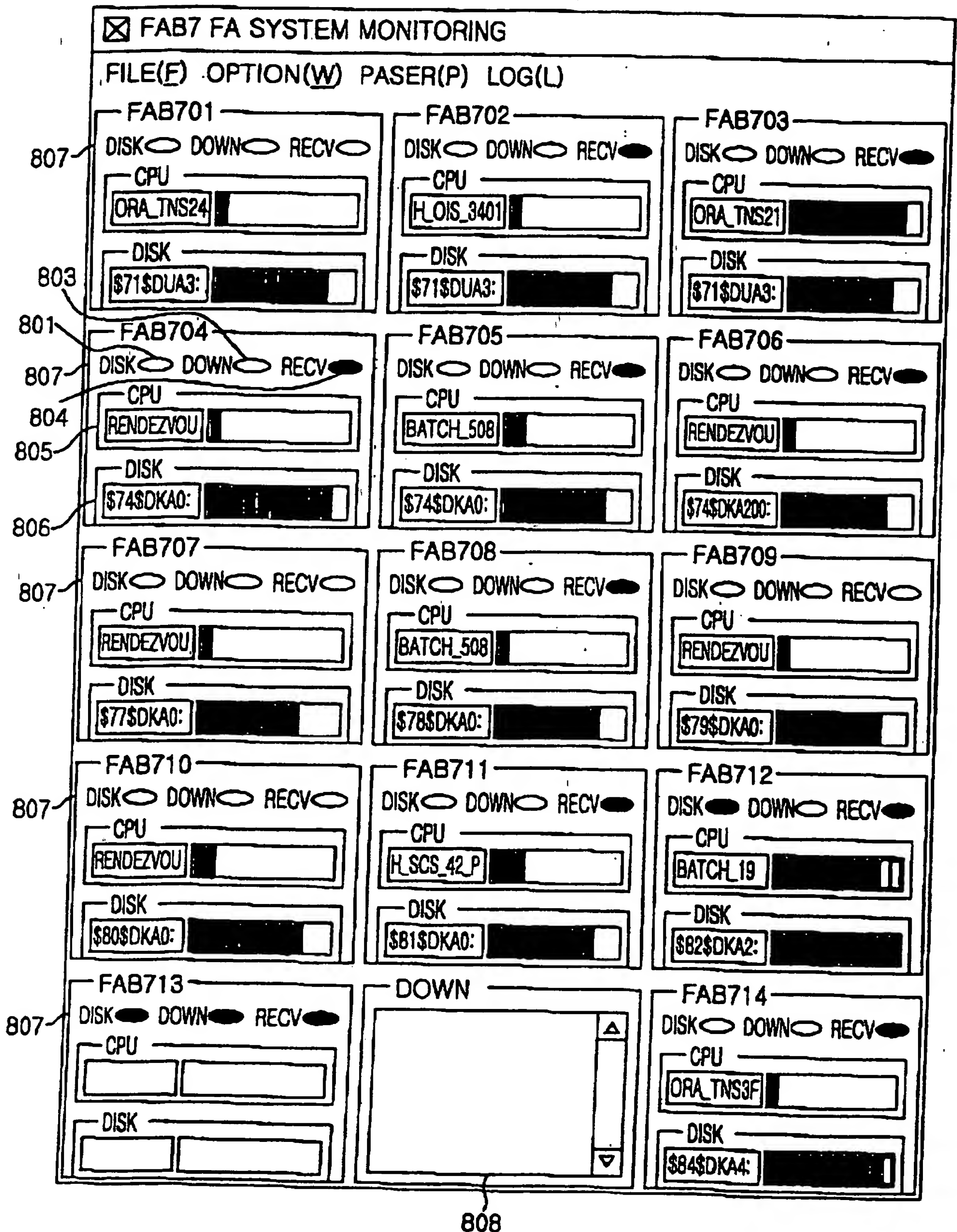


FIG. 4

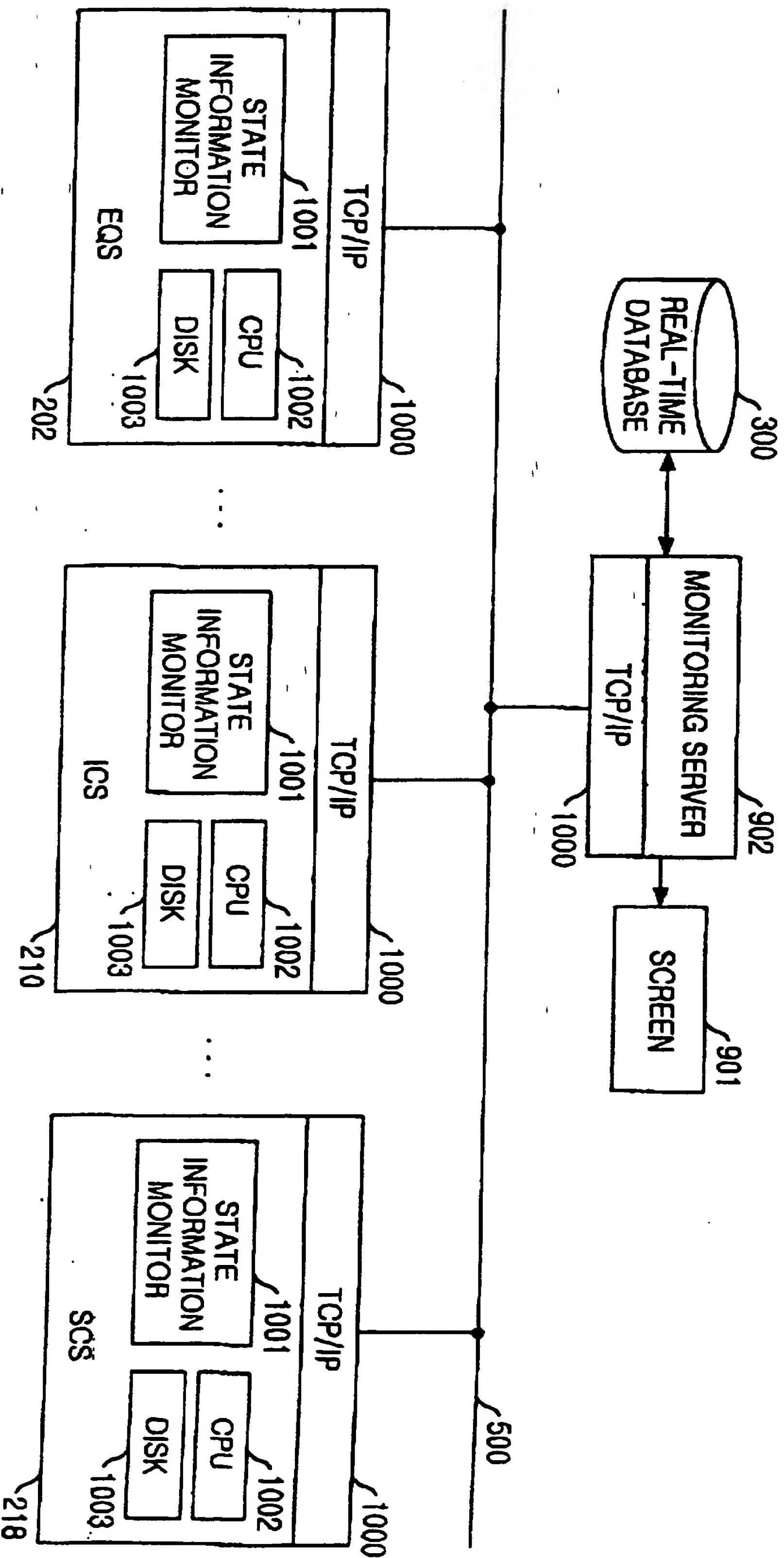
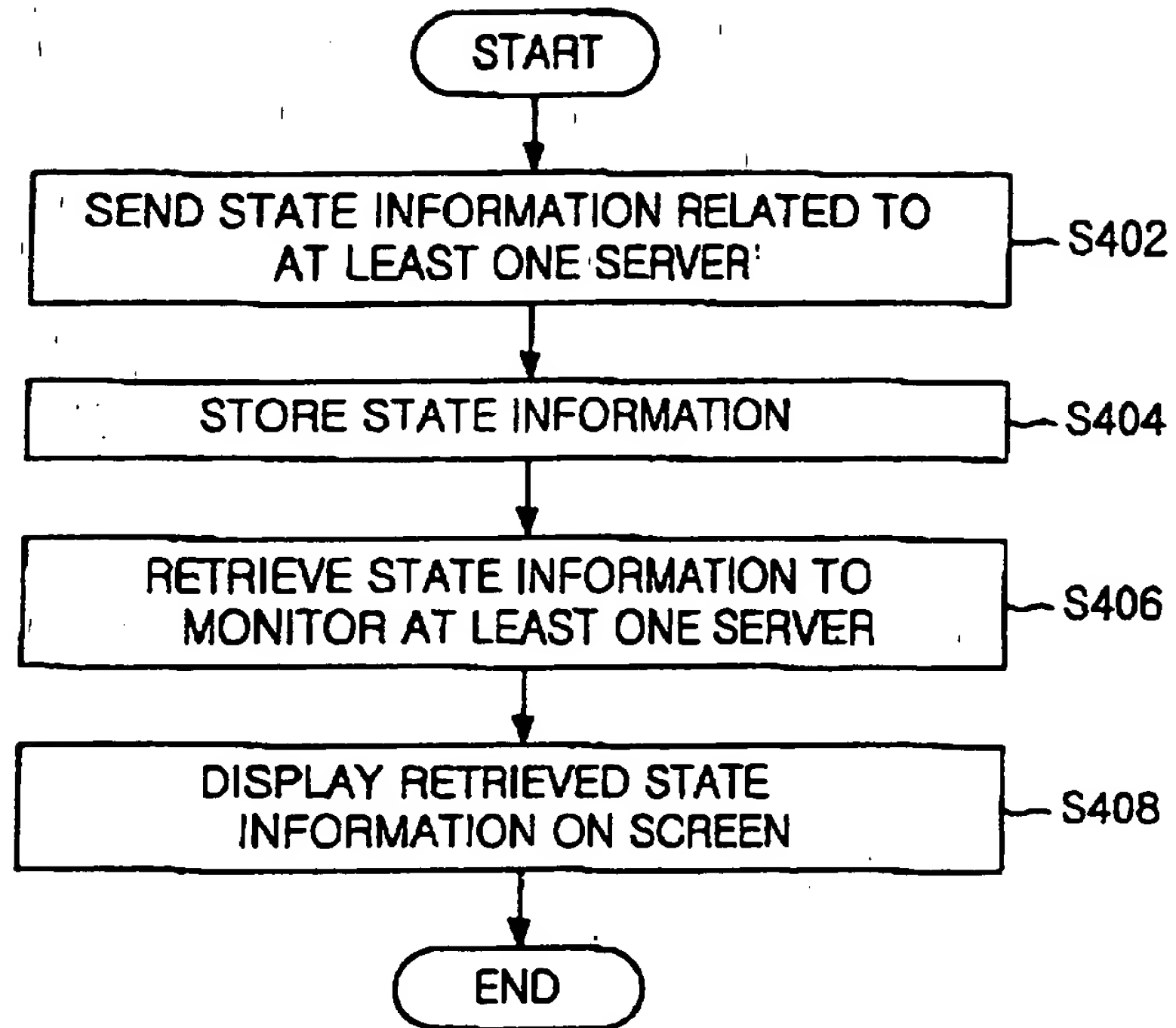


FIG. 5





SEMICONDUCTOR FACTORY AUTOMATION SYSTEM AND METHOD FOR  
MONITORING AT LEAST ONE SERVER IN REAL TIME

5

The present invention relates to a semiconductor factory automation (hereinafter, referred to as FA) system; and, more particularly, to a semiconductor FA system and method for monitoring at least one server in a real time.

10

Generally, a conventional semiconductor FA system automatically processes semiconductor wafers in order to produce semiconductor device, e.g., memory devices. The conventional semiconductor FA system includes process equipments (hereinafter, referred to as EQs), stockers and an automatic guide vehicle (hereinafter, referred to as AGV). An EQ applies a semiconductor process to the semiconductor wafers.

20

A stocker stocks a semiconductor wafer cassette containing the semiconductor wafers to be processed in the EQ. Further, the stocker also stocks the semiconductor wafer cassette, which has been already processed in the EQ.

25

The AGV transports the semiconductor wafer cassette to be processed from the EQ to another EQ or the stocker. Furthermore, the AGV transports the processed semiconductor

wafer cassette from the EQ to the stocker.

In order to automatically control the above elements, e.g., the EQs, the stocker, the AGV and the like, the conventional semiconductor FA system also includes a number of control  
5 servers, e.g., an operator interface server (hereinafter, referred to as OIS), an EQ server (hereinafter, referred to as EQS) and the like.

The control servers employed in the conventional semiconductor FA system have been implemented by using, e.g.,  
10 software programs contained in a large scale computer or distributed in a number of personal computers constituting of a client-server system.

In the client-sever system, a number of personal computers are coupled to a common communication line, e.g., Ethernet<sup>TM</sup>  
15 supplied by Xerox Corporation. Each personal computer includes one or more software programs, each for a control server. In this case, if a personal computer is in an error state, the control servers contained in the personal computer may not perform its appropriate operation. Further, the productivity of  
20 semiconductor device may be seriously affected. Therefore, the semiconductor FA system having a client-server system strongly needs a scheme capable of monitoring operational state of the servers in a real time.

25

It is, therefore, an object of the present invention to

provide a semiconductor FA system and method for monitoring at least one server in a real time so that an operator can easily locate a failure of at least one server.

In accordance with an aspect of the present invention, there is provided a semiconductor factory automation (FA) system, comprising: at least one processor for driving a program process and providing processor state information, wherein the processor state information includes an availability of a central processing unit, an availability of a disk and a state of the program process related to said processor; a storing means for storing the processor state information in a real time; a monitoring means for retrieving the processor state information in said storing means to monitor said processor; and a displaying means for displaying the processor state information retrieved.

In accordance with another aspect of the present invention, there is provided a method for monitoring at least one server in a semiconductor factory automation (FA) system, comprising the steps of: a) providing server state information from at least one server to a real-time database, wherein the server state information includes an availability of a central processing unit, an availability of a disk and a state of a program process related to the server; b) storing the processor state information in the real-time database; c) retrieving the server state information to monitor the server; and d) displaying the server state information retrieved.

The above and other objects and features of the instant invention will become apparent from the following description of preferred embodiments taken in conjunction with the accompanying drawings, in which:

Fig. 1 is a block diagram describing a semiconductor FA system for monitoring at least one server in a real time in accordance with the present invention;

10 Fig. 2 is a block diagram illustrating a transportation control portion shown in Fig. 1;

Fig. 3 is an exemplary view showing a screen shown in Fig. 1;

Fig. 4 is an exemplary view depicting a relationship  
15 between servers shown in Figs. 1 and 2; and

Fig. 5 is a flowchart showing a method for monitoring at least one server in a real time in accordance with the present invention.

20

Referring to Fig. 1, there is shown a block diagram showing a semiconductor FA system for monitoring at least one server in accordance with an embodiment of the present invention. As shown, the  
25 semiconductor FA system includes at least one cell, which have a predetermined number, e.g., 4, of semiconductor production bays 400. A semiconductor production bay 400 is provided with EQs

204, stockers 216 and an AGV 214. The EQ 204 processes semiconductor wafers in order to obtain semiconductor devices. The EQ 204 includes, e.g., an etching equipment, a photolithography equipment, a furnace equipment, a physical vapor deposition (PVD) equipment, a sputtering equipment and the like.

A stocker 216 temporarily stores a number of semiconductor wafer cassettes. Each of semiconductor wafer cassettes has a predetermined number of semiconductor wafers, which is referred to as a lot. The semiconductor wafer cassettes are selectively transported to the EQ 204 by using the AGV 214. The semiconductor wafer cassette stored in the stocker 216 is transported to another semiconductor production bay 400.

A process equipment server (hereinafter, referred to as EQS) 202 is coupled to a common communication line 500, e.g., Ethernet<sup>TM</sup> supplied by Xerox Corporation. An AGV controller (hereinafter, referred to as AGVC) 212 controls the AGV 214.

The semiconductor FA system also includes a cell management portion 100, a real-time database 300 connected to the cell management portion 100, a temporary storage unit 310, a history management portion 312 connected to the temporary storage unit 310 and a history database 314 connected to the history management portion 312. The cell management portion 100, the history management portion 312 and the history database 314 are respectively connected to the common communication line 500 for communication therebetween.

The cell management portion 100 includes a cell management server (CMS) 206, an operator interface server (hereinafter,

referred to as OIS) 201 and a data gathering server (DGS) 207. The DGS 207 stores process data associated with the lot in the real-time database 300.

The real-time database 300 stores information related to states of servers such as the CMS 206, the DGS 207, the OIS 201 and the EQS 202. A monitoring server 902 retrieves the information related to the states of servers in a real time. A screen 901 coupled to the monitoring server 902 displays the retrieved information related to the states of server in the real time. The state information related to the servers includes an availability of a central processing unit (CPU), an availability of a disk, a state of a program process and a state of a connection port of transfer control protocol/internet protocol (hereinafter, referred to as TCP/IP). The state information further has a server identifier.

Referring to Fig. 2, there is shown a block diagram illustrating a transportation control portion shown in Fig. 1. As shown, the transportation control portion 116 includes intrabay control servers (hereinafter, referred to as ICSs) 210 coupled to the common communication line 500 and stocker control servers (hereinafter, referred to as SCSs) 218. The ICS 210 converts a transportation message into a transportation command from the common communication line 500. The SCS 218 generates a stocker control command to control the stockers 216 in response to the transportation command. The AGVC 212 generates an AGV control command to control an AGV 214 in response to the transportation command.

Referring to Fig. 3, there is shown an exemplary view showing a screen shown in Fig. 1. As shown, the screen 901 coupled to a monitoring server 902 shown in Fig. 1 displays states of servers such as the ICS 210, the SCS 218, the CMS 206, the OIS 201 and the DGS 207 shown in Figs. 1 and 2. Display spaces 807 display a state of a corresponding server, respectively. A display space 805 displays an availability of a CPU related to the corresponding server. A display space 806 displays an availability of a disk related to the corresponding server. When the disk, related to the corresponding server, has failed, a light emitting device 801 emits a light of a red color. Further, when the disk, related to the corresponding server, has not failed, the light emitting device 801 emits a light of a green color.

When a program process related to the corresponding server is in a down state, a light emitting device 803 emits the light of the red color. Further, when the program process, related to the corresponding server, is not in the down state, the light emitting device 803 emits the light of the green color.

When a communication between the monitoring server 902 and the corresponding server is disconnected, a light emitting device 804 does not emit the light. Further, when the communication between the monitoring server 902 and the corresponding server is connected, a light emitting device 804 emits the light. A display space 808 displays a name of the program process of the down state.

Referring to Fig. 4, there is shown an exemplary view

depicting a relationship between servers shown in Figs. 1 and 2.

As shown, the monitoring server 902 has transfer control protocol/internet protocol (hereinafter, referred to as TCP/IP) 1000 to communicate with the EQS 202, the ICS 210 and the SCS 218. Similarly, the EQS 202, the ICS 210 and the SCS 218 have the TCP/IP 1000, respectively.

Further, the EQS 202, the ICS 210 and the SCS 218 include a state information monitor 1001, a CPU 1002 and a disk 1003, respectively. The state information monitor 1001 monitors an availability of the CPU 1002, an availability of the disk 1003, a program process and a connection port of the TCP/IP 1000. The state information monitor 1001 sends the availability of the CPU 1002, the availability of the disk 1003, a state of the program process and a state of the connection port of the TCP/IP 1000 to the monitoring server 902.

Referring to Fig. 5, there is shown a flowchart showing a method for monitoring at least one server in a real time in accordance with the present invention.

As shown, at step S402, the servers such as the CMS 206, the DGS 207, the OIS 201 and the EQS 202 send information related to states of the servers to the real-time database 300.

At step S404, the real-time database 300 stores the information related to the states of the servers.

At step S406, the monitoring server 902 retrieves the information related to the states of servers in a real time.

At step S408, the screen 901 displays the retrieved information related to the states of the servers in the real



time. The state information related to the servers includes an availability of a CPU, an availability of a disk, a state of a connection port of TCP/IP and a state of a program process. The state information further a server identifier.

5 Although the preferred embodiments of the invention have been disclosed for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope

of the invention as disclosed in the accompanying claims.

What is claimed is:

1. A semiconductor factory automation (FA) system, comprising:

5 at least one processor for driving a program process and providing processor state information, wherein the processor state information includes an availability of a central processing unit, an availability of a disk and a state of the program process related to said processor;

10 a storing means for storing the processor state information in a real time;

a monitoring means for retrieving the processor state information in said storing means to monitor said processor; and

15 a displaying means for displaying the processor state information retrieved.

2. The semiconductor FA system as recited in claim 1, wherein said displaying means includes:

20 a first display space for displaying the availability of the central processing unit related to said processor; and

a second display space for displaying the availability of the disk related to said processor.

3. The semiconductor FA system as recited in claim 2, 25 wherein said displaying means further includes:

a first light emitting device for emitting a light when the disk has failed;

a second light emitting device for emitting the light when the program process is in a down state; and

a third light emitting device for emitting the light when a communication between said monitoring means and said processor  
5 is disconnected.

4. The semiconductor FA system as recited in claim 3, wherein said displaying means further includes:

a third display space for displaying identification  
10 information of the program process of the down state.

5. The semiconductor FA system as recited in claim 4, wherein said processor is coupled to Ethernet<sup>TM</sup> supplied by Xerox Corporation.

15

6. The semiconductor FA system as recited in claim 5, wherein said at least one processor includes a first processor and a second processor.

20 7. The semiconductor FA system as recited in claim 6, further comprising:

a semiconductor processing means coupled to said first processor for processing a semiconductor wafer cassette containing a predetermined number of semiconductor wafers;

25 a stocking means coupled to said second processor for stocking the semiconductor wafer cassette; and

a transportation means for transporting the semiconductor

wafer cassette from said semiconductor processing means to said stocking means or from said stocking means to said semiconductor processing means.

5 8. A method for monitoring at least one server in a semiconductor factory automation (FA) system, comprising the steps of:

a) providing server state information from at least one server to a real-time database, wherein the server state  
10 information includes an availability of a central processing unit, an availability of a disk and a state of a program process related to the server;

b) storing the server state information in the real-time database;

15 c) retrieving the server state information to monitor the server; and

d) displaying the server state information retrieved.

9. The method as recited in claim 8, wherein said step d)  
20 includes the steps of:

d1) displaying the availability of the central processing unit related to the server; and

d2) displaying the availability of the disk related to the server.

25

10. The method as recited in claim 9, wherein said step d) further includes the steps of:

- d3) emitting a light when the disk has failed; and
- d4) emitting the light when the program process is in a down state.

11. The method as recited in claim 10, wherein said step d) further includes the step of:

- d5) displaying identification information of the program process of the down state.

12. A semiconductor factory automation (FA) system, substantially as hereinbefore described with reference to Figures 1 to 5.

13. A method for monitoring at least one server in a semiconductor factory automation (FA) system, substantially as hereinbefore described with reference to Figure 5.



INVESTOR IN PEOPLE

Application No: GB 0015351.0  
Claims searched: 1-13

Examiner: Nigel Hanley  
Date of search: 5 February 2001

## Patents Act 1977 Search Report under Section 17

### Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:  
UK CI (Ed.S): G4A(AFMA, AFMD, AFML); H4P(PEUX);  
Int CI (Ed.7): G06F 11/30, 11/32;  
Other: ONLINE: WPI, EPODOC, JAPIO

### Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	GB 2236202 A SUN - See whole document. Note running of a system reporting module on computer to be monitored and separate monitoring station (Fig 1)	1,8 at least
X	EP 0913774 A2 HITACHI - See whole document. Note use of managing computer to collect, collate and display information from logs of monitored computers on a network.	1,8 at least
X	EP 0623878 A2 ABB - See abstract and Figure 1. Note use of LEDS to display information gathered across a network bus.	1,8 at least
X	US 5432715 A SHIGEMATSU - See whole document. Note program on monitored computer for transmitting information to a monitoring computer over a network.	1,8 at least

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.